

**SVKM's**  
**D. J. Sanghvi College of Engineering**

**Program: B.Tech in Electronics Engineering**

**Academic Year: 2022**

**Duration: 3 hours**

**Date: 10.01.2023**

**Time: 10:30 am to 01:30 pm**

**Subject: Power Electronics (Semester V)**

**Marks: 75**

**Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.**

- (1) This question paper contains two pages.
- (2) **All Questions are Compulsory.**
- (3) All questions carry equal marks.
- (4) **Answer to each new question is to be started on a fresh page.**
- (5) **Figures in the brackets on the right indicate full marks.**
- (6) **Assume suitable data wherever required, but justify it.**
- (7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	Describe the two-transistor analogy of the silicon controlled rectifier (SCR) with a neat sketch or diagram.  <b>OR</b> i. Draw the structure, symbol & V-I characteristics of TRIAC (no explanation). ii. What is use of free-wheeling diode in single phase controlled converters ?	[05]  [03] [02]
Q1 (b)	i. Describe the R-C firing circuit for thyristor with a neat sketch or diagram. ii. What are the different methods of turning on thyristors.	[05] [05]
Q2 (a)	i. Explain Class A commutation circuit for thyristor with neat sketch or diagram. ii. Discuss any one type of protection method for thyristors.  <b>OR</b> i. Explain construction & structure of IGBT with neat sketch or diagram. ii. Systematically compare DIAC & TRIAC on any five points.	[06] [04]  [05] [05]
Q2 (b)	Explain the operation of a controlled half-wave rectifier with resistive (R) load.	[05]
Q3 (a)	i. Sketch neat circuit diagram of a full-wave fully controlled rectifier in a bridge configuration with R-L load (no explanation or description required). ii. Sketch neat circuit diagram of a full-wave half controlled rectifier in a bridge configuration with R-L load (no explanation or description required).  <b>OR</b> Explain the Class E commutation circuit for thyristor with a neat sketch.	[02] [03]  [05]
Q3 (b)	i. With neat sketch or diagram explain principle of series inverters. ii. With neat sketch or diagram explain principle of parallel inverters.  <b>OR</b> i. Write a short note on PWM inverters. ii. Explain voltage source inverter with resistive load.	[05] [05]  [05] [05]
Q4 (a)	i. What is basic principle of step-up DC to DC converter ? ii. What is basic principle of step-down DC to DC converter ?  <b>OR</b>	[04] [04]

	i. Explain voltage commutated DC to DC converter with neat sketch or diagram.	[04]
	ii. Explain load commutated DC to DC converter with neat sketch or diagram.	[04]
Q4 (b)	Describe the operation of 4 quadrant chopper with neat sketch or diagram.	[07]
Q5 (a)	<b>Solve any two.</b> <ol style="list-style-type: none"> <li>For a type-A chopper dc source voltage =230V, load resistance =10Ω. Take a voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate: Average and rms values of output voltage and Chopper efficiency</li> <li>Describe Class B chopper with neat sketch or diagram.</li> <li>Derive the condition for average voltage and rms voltage for half controlled rectifier circuit..</li> </ol>	[05]   [05] [05] [05]
Q5 (b)	Describe the operation of a single phase mid-point step down cycloconverter with a neat sketch or diagram.	[05]

